Autonomous Contingency Detection and Reaction for Unmanned Aircraft, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Unmanned aircraft systems (UAS) and, in particular, intelligent, autonomous aircraft operating in the national airspace system (NAS) have the potential to significantly impact modern society. They could perform difficult and dangerous tasks such as fire fighting, border patrol, and search and rescue, and dull tasks such as surveying crops. The elimination of a cockpit and pilot makes UAS operation attractive from an economic standpoint. In addition, much of the technology used for autonomy could benefit manned flight as a pilot's aid to help in tasks such as landing on an offshore oil rig. Open questions remain, however, about how unmanned autonomous aircraft can be safely incorporated into the NAS. UAS operating in the NAS must (1) sense and avoid other vehicles and follow air traffic commands, (2) avoid the terrain and land safely without operator intervention, (3) react to contingencies such as engine-out and lost-link scenarios, and (4) be reliable (by FAA airworthiness standards) and cost-effective. The current approach for UAS integration relies on radio links and the operator's acuity to direct them safely. Lost links, however, are unavoidable. UAS must have the capability to make their own decisions based on information available via databases and any information discovered by onboard sensors. Near Earth Autonomy proposes to develop technologies and capabilities leading to fully autonomous systems that are able to discover and adapt to unpredicted changes in their environment, and yet still accomplish the mission, with minimal or no human involvement. This proposal focuses on developing an Autonomous Contingency System in the form of sensors and computer software that will enable UAS of the future to be operable safely in the NAS. Additionally, the proposal addresses how the technical challenges can be met and how the technology developed can be shown to be both trustworthy and commercially viable for general aviation.

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Small Business Innovation Research/Small Business Tech Transfer

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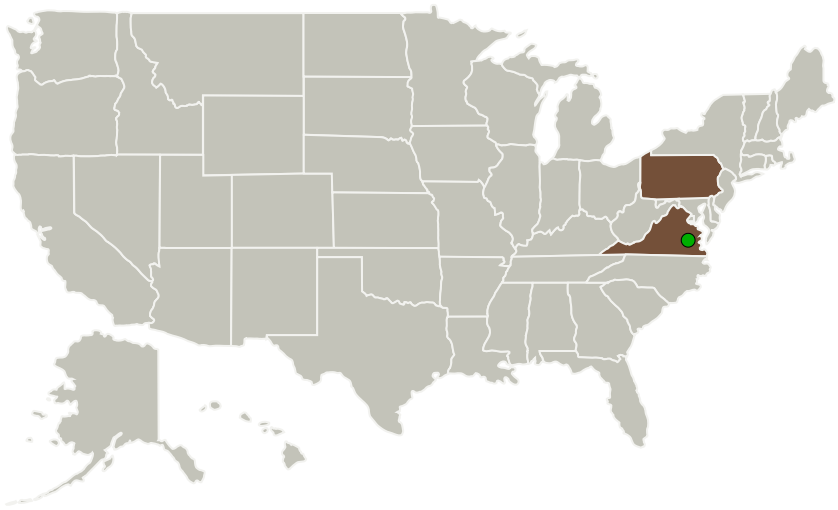
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Near Earth Autonomy, Inc.	Lead Organization	Industry	Pittsburgh, Pennsylvania
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Pennsylvania	Virginia

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139913)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Near Earth Autonomy, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

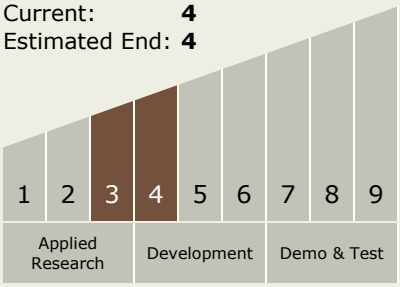
Carlos Torrez

Principal Investigator:

Sanjiv Singh

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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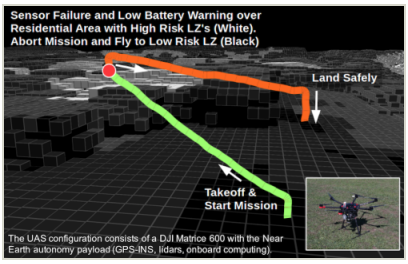
Images

Briefing Chart Image
Autonomous Contingency Detection and Reaction for Unmanned Aircraft, Phase I
(https://techport.nasa.gov/image/135612)



Final Summary Chart Image
Autonomous Contingency Detection and Reaction for Unmanned Aircraft, Phase I Project Image
(https://techport.nasa.gov/image/128205)

Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.4 Execution and Control

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System